Epitomes

Important Advances in Clinical Medicine

Emergency Medicine

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The Council on Scientific Affairs of the California Medical Association presents the following epitomes of progress in emergency medicine. Each item, in the judgment of a panel of knowledgeable physicians, has recently become reasonably firmly established, as to both scientific fact and important clinical significance. The items are presented in simple epitome, and an authoritative reference, both to the item itself and to the subject as a whole, is generally given for those who may be unfamiliar with a particular item. The purpose is to assist busy practitioners, students, researchers, and scholars to stay abreast of these items of progress in emergency medicine that have recently achieved a substantial degree of authoritative acceptance, whether in their own field of special interest or another.

The items of progress listed below were selected by the Advisory Panel to the Section on Emergency Medicine of the California Medical Association, and the summaries were prepared under the direction of Dr Hendey and the Panel.

Noninvasive Ventilatory Support—Saving a Life Without Intubation

IN THE 1950s and 1960s a technique to provide continuous positive airway pressure (PAP) ventilatory support was developed. The technique used a facemask attached to the patient's head with a strap and a ventilator providing continuous PAP. Drawbacks included intolerance to the mask and inability to alter the pressure during the respiratory cycle. Despite these problems, many patients had dramatic improvement—a finding that prompted further refinements. Newly developed nasal and facemasks and the addition of bilevel ventilatory support have improved patient tolerance for the procedure and have enhanced physician control.

Bilevel PAP ventilatory support using a nasal mask provides varying PAP support during expiration and inspiration. In doing so, it relieves fatigue of the respiratory muscles, avoids a decrease in pulmonary compliance, and stabilizes terminal bronchioles and alveolar units; the work of breathing is thus decreased.

The literature reflects the efficacy of bilevel PAP support in patients with obstructive sleep apnea, pulmonary edema, chronic obstructive pulmonary disease (COPD), and asthma—occasionally with dramatic results. Some studies demonstrate a 50% to 80% decrease in the need for intubation in patients in whom this technique was used. Other studies have quantified the fiscal effect of the cost savings associated with the use of bilevel PAP, which decreases the need for admission to, and shortens the length of a patient's stay in, the intensive care unit.

Using nasal bilevel PAP takes some effort. It should be considered in patients with COPD, obstructive sleep apnea, pulmonary edema, and asthma, as well as in patients with a terminal illness who require respiratory support for comfort. Indications for its use include unacceptable or worsening respiratory failure (hypoxia, hypercarbia, or acidosis), increasing respiratory distress or ventilatory muscle dysfunction, or fatigue. Bilevel PAP cannot be used in patients who would be incapable of maintaining life-sustaining ventilation if the device becomes malpositioned, nor can it be used in patients who develop hypotension when placed on the device. Uncooperative or agitated patients or those with significant altered mental status may not be candidates for this technique.

After assuring that the patient is a candidate for nasal bilevel PAP and working with the respiratory therapist, the mask should be properly fit. It should cover the nose from the nasal bridge, but it should not cover any part of the mouth or block the nares. Patients initally may have difficulty tolerating the mask and some coaching may be necessary. Once the appropriate mask is placed on the patient, nasal bilevel PAP is begun with initial settings of 8 cm to 10 cm H_2O inspiratory PAP (IPAP) and 3 cm to 5 cm H_20 expiratory PAP (EPAP). Oxygen is fed into the system via a side port and initial FiO_2 should be set at 2 to 5 liters per minute. Using pulse oximetry as a guide, FiO_2 can be increased by augmenting the flow from the wall source to the side port. If the patient has continuing hypoxemic respiratory failure, both the IPAP and the EPAP should be increased in 2 to 3 cm H_2O increments. In patients with continuing hypercarbic respiratory failure, IPAP *only* should be increased in 2 to 3 cm H_2O increments. All patients should be monitored with a cardiac monitor, blood pressure cuff, and pulse oximeter; they should be watched closely for the development of hypotension or signs of barotrauma. If the patient vomits, the mask and system should be removed immediately. It can be restarted once the patient has stopped vomiting.

The literature supports the use of this device in the emergency setting in many patients with impending respiratory failure. Hospitals would be well served to keep one of these machines in their emergency departments.

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Intravenous Amiodarone for Treating Acute Life Threatening Arrhythmias

IN 1995 an intravenous formulation of amiodarone was approved by the FDA for treating refractory ventricular tachycardia and fibrillation (VT/VF). Intravenous amiodarone holds great promise for the emergency treatment of unstable VT/VF, and it may also be useful for the treatment of atrial fibrillation (AF) in unstable patients.

Intravenous amiodarone has a myriad of electrophysiologic effects, some of which differ from the oral formulation. Central among these effects is the prolongation of the action potential in all cardiac tissues (Class III), but intravenous amiodarone also blocks calcium channels (Class IV) and has β-adrenergic blocking actions (Class II). The magnitudes of the various electrophysiologic effects are dependent on both dose and duration of therapy, with Class IV and Class II effects predominant first. The significance of these electrophysiologic properties lies in amiodarone's antiarrhythmic effects on both supraventricular and ventricular arrhythmias.

The role of intravenous amiodarone in the management of unstable VT/VF is evolving. Although smiodarone does not yet apper in the American Heart Association's advanced cardiac life support treatment algorithm for VT/VF, emerging evidence suggests that VT/VF treatment is at least as effective as bretylium. A randomized double-blind study (involving 302 patients) found amiodarone to be as effective as bretylium, with a significantly lower incidence of hypotension in the amiodarone group (19% versus 32%). Another randomized trial, involving 504 patients in cardiac arrest from sustained VT/VF, showed that administering amiodarone in a prehospital setting was associated with a significant improvement in survival with emergency department admission compared to standard therapy. Additional small nonblinded case series suggest that amiodarone is more effective than lidocaine or procainamide as first- or second-line therapy for VT. Taken as a whole, these data support the replacement of bretylium by amiodarone as third-line therapy after defibrillation and lidocaine for unstable VT/VF and, if confirmed by further studies, perhaps establish a role for amiodarone as the primary antiarrhythmic medication.

Intravenous amiodarone has also been studied in unstable patients with atrial fibrillation. The treatment of these patients represents a difficult therapeutic challenge. Current therapies including pharmacologic or electrical cardioversion and rate control with digoxin or calcium channel blockers may be ineffective or relatively contraindicated. Small studies have suggested amiodarone is a reasonable alternative in these patients. In one study, nine critically ill patients with atrial fibrillation and ejection fractions less than 15% received intravenous amiodarone. Eight of these patients converted, and all showed ventricular rate control. Another study randomized a heterogeneous group of 42 stable and unstable patients with supraventricular tachycardias to receive intravenous amiodarone or magnesium. Of these, 36 (86%) had irregular atrial tachycardias—predominantly atrial fibrillation or flutter. Amiodarone and magnesium were equally effective for rate control; patients in the magnesium group, however, were more likely to return to sinus rhythm. Although available data do not allow conclusive recommendations for the management of atrial fibrillation in unstable patients, amiodarone is a reasonable consideration.

The side effect profile of IV amiodarone is comparable to that of other antiarrhythmics. Hypotension is the most common significant adverse reaction. Principally due to vasodilation, hypotension generally responds well to intravenous fluids or low dose dopamine. Amiodarone's β-adrenergic blocking effects can result in bradyarrhythmias, which are treated in the usual manner but may ultimately lead to the discontinuation of the drug.

Intravenous amiodarone is expensive. The pharmacy cost of a 150 mg vial exceeds $55; and the cost of a one-day infusion is about $400. Current evidence suggests that IV amiodarone is *clinically* effective for life-threatening VT/VF and *possibly* effective for patients with unstable atrial fibrillation. Whether amiodarone is a *cost*-effective solution for patients with these serious arrhythmias remains to be determined.

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Emergency Department Management of Falls in the Elderly

THE US population is growing older, and the most rapid growth is among the oldest of the old. Falls are a substantial problem in older persons, occurring in approximately one-third of those 65 years and older.